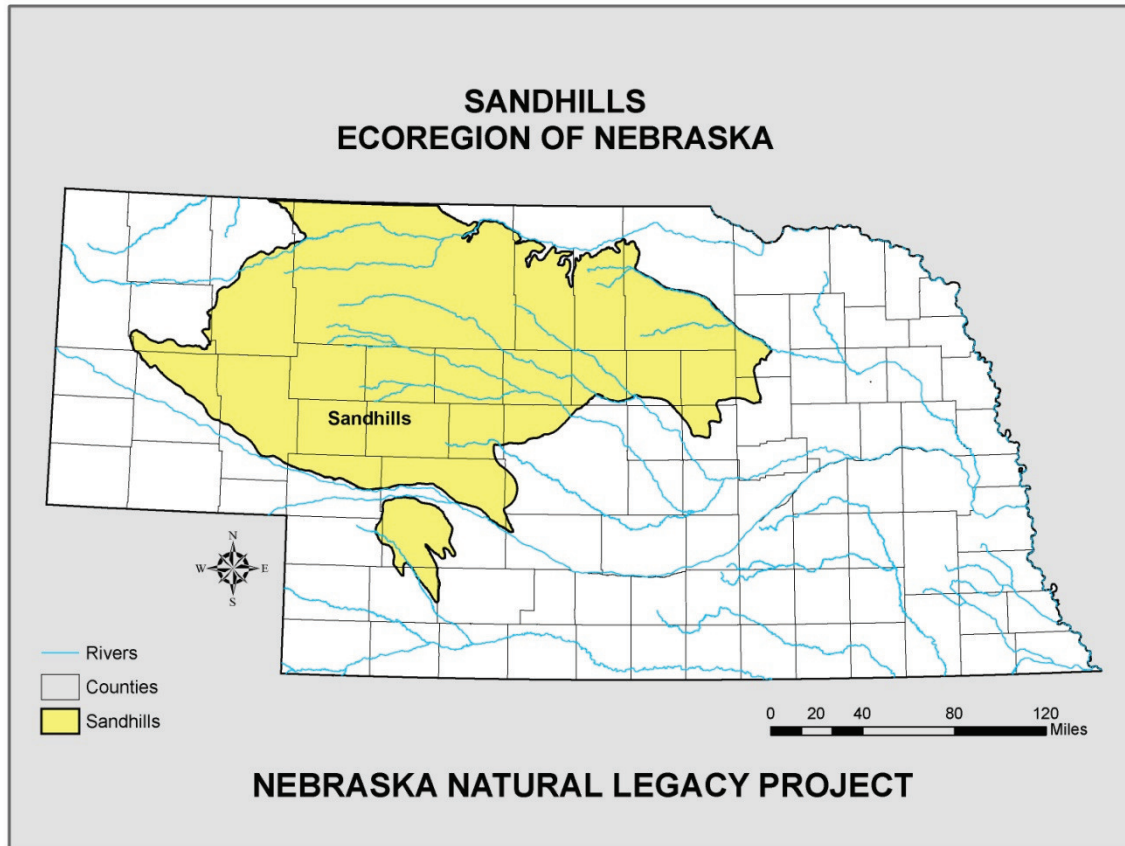


Chapter 7

Sandhills Ecoregion



Introduction

It's easy to be awestruck by the magnitude of the Nebraska Sandhills and its unspoiled natural condition. Covering 19,300 square miles in north-central Nebraska, the Sandhills Ecoregion includes the largest stabilized dune system in the Western Hemisphere and one of the largest, intact native grasslands in North America. The Sandhills remain as one of the last large vestiges of the Great American Plains.

Geologically, the Sandhills are young. Several major episodes of major dune formation have occurred over the last 13,000 years and several periods of drought-induced sand movement have occurred during the last 1,000 years. Scientists speculate that, at times in its history, the Sandhills were a sea of blowing sand, similar to today's Sahara desert. Dunes of the Sandhills are aligned primarily in a northwesterly to southeasterly direction in accordance with prevailing winds and some reach over 400 feet in height.

The Sandhills climate is semiarid with precipitation ranging from 23 inches per year in the east to less than 17 inches per year in the west. Temperatures average highs of approximately 88 degrees Fahrenheit in mid-summer and average lows of approximately 9 degrees Fahrenheit in mid-winter. The sandy dune soils are poorly developed with a thin layer of topsoil containing little organic matter because of their geologically young age. High infiltration rates, up to 10 feet per day, allow rainwater and snowmelt to percolate rapidly downward. Extensive aquifers, up to 900 feet thick, have formed below the dunes, mainly in sand and gravel deposits. The underground reservoir is part of the Ogallala aquifer and contains an estimated 700-800 million acre-feet of groundwater, nearly double the amount of water found in Lake Erie.

Where the region's high water table intersects the ground surface in Sandhill valleys, nearly 2,000 shallow lakes and over a million acres of wetlands have formed. Most lakes and large marshes are clustered near stream headwaters and in the western portion of the Sandhills. Only a few are over 1,000 acres in size and all are shallow, with the greatest depth less than fourteen feet. The wetlands cycle water from the aquifer to the atmosphere through evapotranspiration. This moisture later falls as rainfall, creating an environment on the sandy dunes conducive to grassland establishment.

Most Sandhill lakes, marshes, and wet meadows are near neutral pH, though alkaline wetlands and lakes are common in the western Sandhills where salts and carbonates have accumulated in wetland soils. The Sandhills region contains some of the Great Plains' largest fens, groundwater-fed wetlands with peat or muck soils. They are found generally at the headwaters of streams and the upper end of Sandhill lakes and marshes where groundwater discharge is abundant. Their organic soils can be up to 21-feet thick, formed from the buildup of undecomposed plant material over thousands of years.

Southeasterly flowing streams, such as the North Loup, Middle Loup, Calamus, Cedar, and Dismal rivers, drain much of the central and eastern Sandhills. Their flows are derived almost entirely from groundwater discharge with little from run-off. The flow of these rivers is remarkably consistent, with few high or low flows. The Niobrara River is the only Sandhills river that originates outside the ecoregion. Its headwaters are in eastern Wyoming and it flows easterly through the northern Sandhills before entering the Missouri River in northeastern Nebraska. The Sandhills contains many smaller streams including the Minnechaduza, Pine, Boardman, and Birdwood creeks.

Vegetation

The Sandhills contain a variety of native plant communities ranging from wetlands to dry upland prairie. Nearly 700 native plant species have been documented in the Sandhills, including several at-risk species. Two principal plant community types are found in the Sandhills Ecoregion: dune prairie and valley wetlands.

The Sandhills dune prairie community consists of a mixture of sand-adapted grasses including sand bluestem, prairie sandreed, little bluestem, and hairy grama. Representative forbs include stiff sunflower, bush morning glory, gilia, annual buckwheat, and Plains gayfeather. Common shrubs include sand cherry, leadplant, prairie rose, and yucca. Blowouts, wind-excavated depressions in dune tops, are habitat for the federal and state-

threatened blowout *Penstemon*. This rare species grows only in the Nebraska Sandhills and a few sand dune complexes in Wyoming. Blowouts are uncommon today because of decreased frequency of fire on the landscape and range management practices that limit the effects of wind on erosion.

Tall grasses, including big bluestem, Indian grass, and switchgrass are abundant in moist prairie in dune valleys. Forbs found here include asters, white sage, and prairie-coneflower. Common shrubs include leadplant, dwarf prairie rose, and western wild rose.

Native woodlands are uncommon in the Sandhills and are found only in fire-protected river valleys and bluffs. Plains cottonwood, peachleaf willow, and coyote willow dominate riparian woodlands along many Sandhill streams. Native shrub thickets of chokecherry, wild goose plum and snowberry found in prairies of the Sandhills are important habitats for some native bird species. The Middle Niobrara River valley contains the most extensive woodlands in the Sandhills. Eastern deciduous woodlands containing bur oak, basswood, black walnut, and green ash grow on south-facing bluffs. Cool, moist, spring-fed canyons along the south bluff contain glacial relict woodlands dominated by paper birch and quaking aspen-trees characteristic of more northern environments. These species have been in decline in recent decades. The steep, rocky, north river bluff supports ponderosa pine dominated woodlands characteristic of the Rocky Mountains. Both Sandhills prairie and northern mixed-grass prairie are also found along the bluffs. The Middle Niobrara river valley has been referred to as a biological crossroads of the Midwest because of the diverse mixture of plant communities and animal species found there.

Wet meadows occur in Sandhill valleys where the water table remains near the surface throughout the year. The sandy to fine sandy loam soils of freshwater meadows support lush vegetation dominated by sedges, spikerushes, prairie cordgrass, and switchgrass. Shrubs, such as sandbar willow and false indigo-bush also occur in this community. Alkaline wet meadows are dominated by inland saltgrass, foxtail barley, alkali sacaton, bluegrass, and scratchgrass. Fens of the Sandhills are dominated by a meadow-like vegetation of grasses, sedges and shrubs. Their saturated organic soils support nearly twenty at-risk plant species.

Freshwater marshes in the Sandhills have shallow standing water most of the year and occur in isolation, as zones around lakes, or as borders to streams. Common marsh plants include riggut sedge, common reed, smartweeds, hard-stem bulrush, broad-leaf cattail, duckweeds, and coontail. Alkaline marshes of the Sandhills support sparse vegetative cover of species such as Nevada bulrush, saltmarsh bulrush, and other alkaline-tolerant plants.

Animals

More than 300 species of resident and migratory birds have been documented in the Sandhills. The region is a stronghold for sharp-tailed grouse and greater prairie-chicken and is considered to be an important breeding site for the world's largest sandpiper, the long-billed curlew. The Sandhills contain substantial breeding populations of upland sandpiper, vesper sparrow, lark bunting, grasshopper sparrow, and western meadowlark. The American Bird Conservancy has described the Nebraska Sandhills as the "best grassland bird place in the United States." The Sandhills host the highest concentrations of northern harriers in the state, and ferruginous hawks are common breeders in the western Sandhills. Over a quarter

million waterfowl have been recorded during May surveys and the area is the most important breeding area for mallards, blue-winged teal, and northern pintails south of the prairie pothole region. Other waterbirds that are common breeders in the Sandhills include Wilson's phalarope, American avocet, western grebe, and black tern. Although woodlands are mostly confined to stream corridors, woodland species such as black-billed magpie, Bell's vireo, black-and-white-warbler, and rose-breasted grosbeak are known to nest in the Sandhills.

The Sandhills are home to 55 species of mammals. Many mammals found in the Sandhills Ecoregion are widespread with no distinct affiliation to the region. Small mammals include upland species such as the plains pocket gopher, white-tailed jackrabbit, Ord's kangaroo rat, and prairie voles. Species such as the masked shrew, jumping mouse, and meadow vole can be found associated with wet meadows and other wetlands. The most abundant large mammals include mule deer and white-tailed deer. The Sandhills support a few elk and relatively small numbers of pronghorn, particularly in the west. Although free-roaming bison no longer occur in the Sandhills, The Nature Conservancy's Niobrara Valley Preserve manages a pseudo-natural bison herd on their 56,000-acre preserve along the Niobrara River. A few Sandhill ranches owned by local residents manage bison as well. Coyotes are common throughout the ecoregion, and bobcats can be found in many riparian areas. In recent years, biologists have confirmed several sightings of mountain lions in the region. One of the rarest mammals of the Sandhills is the Bailey's eastern woodrat – a subspecies found only in north central Nebraska.

Streams and lakes of the Sandhills are home to 75 species of fish. Many common species are big river generalists, which can withstand a wide variation of environmental extremes. Among these are the channel catfish, flathead chub, and river carpsucker. Most rare Sandhills fish species, including the blacknose shiner, pearl dace, northern redbelly dace, and finescale dace are northern species with their Sandhills populations being disjunct from their principal range. These species are less tolerant of habitat disturbance and are now restricted to fairly stable headwater streams. Game fish, primarily yellow perch, northern pike, largemouth bass, bluegill, and carp, have been introduced into many lakes in the Sandhills, and trout have been introduced into several coldwater streams.

Twenty-seven species of amphibians and reptiles are found in the Sandhills, including one salamander, three toads, four frogs, six turtles, four lizards, and nine snakes. The Great Plains toad, plains spadefoot, and Woodhouse's toad use Sandhills wetlands for breeding while spending most of their adult life in the uplands. The ornate box turtle is probably the most well known Sandhills reptile. Blanding's turtle, a northern species whose range extends to New England is rare over much of its range but is fairly abundant in lakes and marshes of the Sandhills. Three small lizards are common on the sand dunes. The six-lined race runner prefers dense vegetation, while the lesser earless lizard prefers more sparsely-vegetated open sand habitats. The northern prairie lizard commonly forages in blowouts. The bullsnake and western hognose snake are probably the Sandhills' most common snakes. The prairie rattlesnake is the region's only venomous snake and lives primarily in the Niobrara River valley and prairie dog towns.

Insects are important to the ecology and economy of the Sandhills; they serve vital functions as pollinators, decomposers, grazers, and food for other wildlife. They are also the most

diverse, abundant, and least-studied animal group in the Sandhills. Seventy species of scarab beetles have been documented for Thomas County alone, and numerous species of butterflies are known to inhabit the Sandhills. Possibly the rarest insect in the Sandhills is the federally and state endangered American burying beetle. The Sandhills are one of the last known strongholds for this species that once ranged over much of the eastern United States.

Rich in flora and fauna, the Nebraska Sandhills remain one of the highest-quality, intact prairie landscapes in the country. Although the region has not completely escaped the impacts of the modern world, it will likely continue as a hotspot of Great Plains biological diversity well into the future.

History and Dominant Land Use

Relatively little is known about Native American use of the Sandhills. Few cultural resource surveys have been conducted and this extensive undisturbed grassland has limited archeological discovery. Human use of the Sandhills likely dates back at least 10,000 years. The first human inhabitants were probably nomadic and used primitive weapons to hunt mammoth, horse, camel, and other now extinct species. The first year-round settlements likely occurred along lakes and streams beginning 1,000 - 2,000 years ago. Like most native plains people, they subsisted using a mixed economy of agriculture (corn, beans, squash), hunting, and gathering. Nearly a dozen tribes are known to have lived or hunted in the Sandhills around the time of Euro-american exploration of the region. Tribes present included the Plains Apache, Pawnee, Comanche, Ponca, Omaha, Teton Sioux, Oglala and Cheyenne.

The first Euro-american visitors to the Sandhills are believed to be trappers and hunters who traveled along streams in search of game. James McKay was the first known non-indigenous explorer to venture into the heart of the Sandhills and write an account of his journey. During his 1796 expedition, he remarked that the region was “a great desert of drifting sand...” In 1854, the Corps of Topographical Engineers assigned Lieutenant G. K. Warren the task of surveying for a map of the trans-Mississippi West. His travels from 1855 to 1857 included the Nebraska territory. He traveled through the Sandhills and later commented that permanent settlement in the region was unlikely because of its unfavorable climate and lack of soil fertility.

It was not until the 1870's that early cattlemen began discovering the Sandhills' potential as rangeland. One of the first ranches in the Sandhills was organized in 1877 by E.S. Newman on the Niobrara River to provide cattle to Native Americans living on the Pine Ridge reservation. Cattle were kept from grazing the more rugged sandhills south of the river until a spring blizzard in 1879 scattered more than 6,000 cattle into the adjacent lands. Hoping to salvage a small portion of the lost stock, cowboys not only found the lost cattle but also large herds of well-fattened and watered cattle which had been thriving on Sandhill grasses. By the late 1880s, the Sandhills had become an important cattle-raising region.

Most early ranches were large, and cattle were left unfenced to graze freely. In the early 1900's, Moses Kinkaid, a Congressman from O'Neill secured passage of the Kinkaid Act. This act encouraged settlement in the Sandhills by increasing the maximum land claim from

160 acres to 640 acres. Between 1910 and 1917, nearly nine million acres were claimed by “Kinkaiders.” Most attempts at farming failed, but ranching succeeded and the population in the Sandhills grew from about 67,000 in 1900 to over 95,000 by the 1930’s. In the mid-1930’s, severe drought gripped the Great Plains. During this time, some ranchers discovered that the impacts of drought could be partially mitigated by switching to a rotational grazing system.

Many feel that these small ranches helped foster a close personal relationship between ranchers and the Sandhill grasslands, a relationship that still exists today. Early ranchers learned about the fragile nature of the Sandhills and the inextricable connection between conserving the region’s grasslands and economic viability. Ranchers of the Sandhills were some of the first groups to widely accept the use of planned rotational grazing, a technique that, if used properly, is compatible with biological diversity conservation. Some ranchers manage their property in a way that benefits grouse and other wildlife. The ranchers are widely credited with helping to maintain the area’s rich biological diversity through their commitment to sound stewardship.

Today, approximately 95 percent of the Sandhills are maintained as native grasslands, primarily for livestock production. Ranch sizes vary widely and cattle outnumber people in the Sandhills by 20:1. Overall, more than a half million head of cattle are supported in the Sandhills annually.

Crop production peaked in the 1970’s when center pivot irrigation technology was refined. Much of the native grassland on the periphery of the Sandhills was converted to cropland at this time in what turned out to be a misguided and a largely unsuccessful attempt to farm large portions of the Sandhills. Many ranchers still view this as one of the low points in Sandhills history. Numerous formerly cropped lands have now been reseeded to grass and put into the Conservation Reserve Program. However, there is always a risk that history will repeat itself, particularly when crop prices peak.

Nature-based Recreation

The Nebraska Sandhills are ideally suited for nature-based recreation. As one of the largest remaining grassland landscapes in the United States, the Sandhills have a unique allure to those wishing to gain a glimpse of America’s prairie past. The Sandhills are well known to upland game hunters and birdwatchers alike. The region sports some of the nation’s best sharp-tailed grouse and prairie-chicken hunting in the fall and premier prairie grouse courtship viewing in the spring. Many species of waterfowl and shorebirds can be seen in the spring, including large concentrations of pintails, grebes, and phalaropes. Great Plains endemics like long-billed curlew, chestnut-collared longspur, Le Conte’s sparrow, and rare species like trumpeter swan also inhabit the Sandhills. In all, more than 300 species of birds have been recorded in the Sandhills.

Big game, upland game, and waterfowl hunting in the Sandhills offer an unparalleled experience of panoramic views of native landscapes and solitude made possible by low hunter density. Abundant populations of mule deer, white-tailed deer, wild turkey, and even an occasional pronghorn provide pleasure to nature enthusiasts. Natural Sandhills lakes are

regarded for their bluegill, northern pike, perch, and largemouth bass fishing. Merritt and Calamus reservoirs provide excellent fishing, as well as spectacular scenery. The region's rivers, although often overlooked, can provide quality fishing for catfish and other game species.

There are thousands of acres of public land in the Sandhills, including three national wildlife refuges, two national forests, and numerous state wildlife management areas and state recreation areas. The 56,000 acre Niobrara Valley Preserve, owned by The Nature Conservancy, is one of the organization's larger preserves. Seventy-six miles of the central Niobrara River are part of the National Wild and Scenic River system and comprise one of the top canoeing destinations in the country, attracting over 20,000 river users each year. There are over 10 outfitters in the Valentine area who provide canoe, kayak, and inner-tube rentals. Other rivers such as the Dismal and Loup, provide quality canoeing and kayaking but are relatively unused. The Dismal River is the most difficult river to canoe in Nebraska and offers a challenge to thrill seekers. A growing number of private businesses cater to nature enthusiasts by providing lodging, canoe/kayak rentals, horseback riding, and access to large tracts of private lands for wildlife viewing, hunting, and fishing.

State highways and secondary roads provide easy access to the most popular nature-recreation sites in the region. The Sandhills Scenic Byway (State Highway 2) that cuts through the heart of the Sandhills is considered one of the top ten scenic byways in the country. Access to some areas requires driving on hard-packed sand roads. The sparsely populated Sandhills offers one of the last accessible places in the continental US to observe celestial objects free from light pollution. Once completed, the Cowboy Trail, a biking trail that spans the entire northern Sandhills, will be the nation's longest rails-to-trails conversion. It provides hikers and bicyclists a unique way to view the Sandhills.

Education

Many Sandhills residents have a close affiliation with the land. Ranchers are often eager to share their knowledge of Sandhills' wildlife and plants and the role ranching has played in conservation. North of Taylor, a local group of ranchers have created a roadside rest area with interpretive signage that provides information on native plants, Sandhills ecology, and ranching. Currently, there is no single organization or educational institution that is devoted specifically to natural history and environmental education in the Sandhills. Instead, there are many distinct and loosely connected entities involved in wildlife education in the Sandhills.

The U.S. Fish and Wildlife Service operates a visitor center at the Fort Niobrara National Wildlife Refuge that explains the fort's history, local wildlife, and refuge management. The Nebraska Game and Parks Commission's Smith Falls State Park, located in the Niobrara River valley, has an interpretive, self-guided nature trail. The Calamus Fish Hatchery includes a small visitor center that describes the area's fish and wildlife. The Gundmunson and Barta Brothers ranches provide learning opportunities about ranching in the Sandhills. The Niobrara Valley Outdoor Education Partnership is a coalition of natural resources professionals and educators working collectively to provide environmental education focused on the Niobrara River valley. Partners include the National Park Service, US Fish and

Wildlife Service, Natural Resource Conservation Service, Nebraska Game and Parks Commission, Nebraska Forest Service, Middle and Lower Niobrara NRDs, Niobrara Council, Northern Prairies Land Trust, and public school educators in Boyd, Brown, Cherry, Holt, Keya Paha, and Rock counties.

The Nebraska state 4-H camp located within the Halsey Unit of the Nebraska National Forest provides a unique setting for educational activities in the Sandhills. The camp includes lodging and dining facilities, an auditorium, hiking trails, and access to canoeing. A summer youth camp, the Becoming an Outdoors Woman program, outdoor skills camps, and meetings of organizations such as the Nebraska Ornithologist Union take place at the camp each year exposing hundreds of individuals to the Sandhills.

Each year, a Sand Hills Discovery Experience conference is held in Ainsworth, Nebraska. Natural history themes are selected based on topics of interest in the Sandhills ecoregion. Agenda items have included talks on vegetation, geology, hydrology, wildlife, and paleontology. Experts in each of the areas of interest present information and lead discussions on the various subjects.

A number of schools in the Sandhills already offer curriculum involving study of the ecoregion and experiential educational opportunities. Yet, the need and interest for increased environmental education in the region is strong. Formal educators of both early childhood and K-12 students request more training on both environmental education in general, and ecoregion-specific knowledge.

Post-secondary education, however has been underutilized to teach agricultural and ranching philosophies and techniques that are better for the environment but also productive. Educational programming, in cooperation with Cooperative Extension, can be used to reach out to agricultural producers and post-secondary education administration to provide curriculum for new professionals on habitat management techniques compatible with agricultural operations.

Organizations and Partnerships

The Sandhills ecoregion has partnerships, coalitions, and grass roots efforts formed to conserve the region's biodiversity values. Groups include, but are not limited to, the following:

The Sandhills Task Force was created in 1991. It's a non-profit with 16 board members comprised of local ranchers and representatives from Nebraska Game and Parks Commission, U.S. Fish and Wildlife Service, The Nature Conservancy, Natural Resources Conservation Service, and Nebraska Cattlemen Association. Its goal is to enhance the natural resources in the Sandhills by supporting wildlife and profitable private ranching. The Task Force has been successful in bringing landowners and conservation groups together to complete projects involving grassland enhancement, wetlands and stream restoration, research, technical assistance, education, outreach, and a few conservation easements. The organization works with willing landowners and government agencies to develop conservation strategies that benefit both ranching and wildlife. The Sandhills Task Force

publishes an annual accomplishment report that details positive impacts on tens of thousands of acres each year. www.sandhilltaskforce.org

The Niobrara Council is a grassroots-driven organization formed in 1997 to assist the National Park Service in managing and protecting Niobrara National Scenic River resources. It was formed by local individuals who wished to have an active voice in Niobrara River management issues and to help preserve the rural characteristics, scenic qualities, and private ownership of land in the area. The council was originally formed by an inter-local agreement between Brown, Cherry, Keya Paha, and Rock counties. In 2000, the Council was strengthened when legislation made it a state-recognized organization with river management responsibility, development coordination authority, and the ability to hold conservation easements and title to land. Currently, the council has 16 members consisting of representatives from local, state, and federal agencies, local landowners, county commissioners, businesses, outfitters, the wood-products industry, and the environmental community. The diverse makeup of the council provides a wealth of knowledge, experience, and new perspectives regarding river management issues. Although the "Niobrara Council" concept was a departure from conventional approaches to natural resource management, the cooperative experiment has proven to be extremely effective and now serves as a model for others throughout the nation. www.niobaracouncil.org

The Middle Niobrara Weed Awareness Group was formed in 2001 to better coordinate weed management activities along the Niobrara River corridor. The purpose of the organization is to help local landowners become aware of the potential threat of noxious weeds and to facilitate communication amongst agencies, organizations and the public. The group is involved in mapping occurrences of noxious weeds and identifying effective control measures. Members include The Nature Conservancy, National Park Service, Niobrara Council, Brown County Weed Control, Rock County Weed Control, Cherry County Weed Control, Keya Paha Weed Control, Nebraska Dept. of Agriculture, Nebraska Board of Education Land and Funds, U.S. Fish and Wildlife Service (Ft. Niobrara NWR), U.S. Geological Survey, and private landowners. mnwag.org

The Niobrara Valley Prescribed Fire Association aids private landowners within the Niobrara River drainage area of Nebraska in gaining the skills necessary to implement prescribed burns. Workshops, seminars, and post-burn tours educate landowners on the benefits of prescribed fire and how to implement it safely. The organization provides support, specialized tools, and equipment to participants. www.nvpfa.org

Ecoregion-specific Stresses

Key Stresses

In addition to the stresses and conservation actions identified in this chapter for the Sandhills Ecoregion, statewide concerns are identified also in chapter four. Conservation practitioners identified the following stresses as the top threats in the ecoregion.

Altered natural frequency of grazing and burning: Although the predominance of ranching in the Sandhills is responsible for sustaining a rich complement of biological diversity, grazing patterns do not exactly mirror grazing by native herbivores. Historically, grazing intensity varied seasonally and from year-to-year. As a result there is now less diversity in vegetation composition and structure, resulting in an overall reduction in biological diversity. Grazing strategies that are promoted should be appropriate to the enhancement of local plant communities. Fire frequency was much higher prior to settlement and there were likely beneficial synergistic relationships between fire and grazing. Woody vegetation has increased along rivers and streams because of reduced fire frequency, with eastern red-cedar being a primary species of concern.

Wetland and wet meadow drainage: Past ditching and drainage of wetlands has impacted aquatic resources in the Sandhills. Wet meadows are biologically diverse communities but composition changes when natural hydrology is altered. Unique wetlands such as fens are often highly degraded when ditched.

Spread of invasive species: Invasive species are a threat to biological diversity in the Sandhills. The introduction of carp has degraded many lakes, wetlands and streams. Purple loosestrife and reed canary grass threaten riparian areas and wetlands. Musk thistle and leafy spurge are threats to prairie communities. Eastern red-cedars need to be controlled to limit their spread. However, as we work to combat invasives, it is best to implement control measures carefully in order to avoid devastating native shrub and forb habitat.

Excess deer browsing: Excess browsing by deer can degrade native woodlands and impact agricultural production in areas.

Interbasin water transfer: Large-scale export of Sandhills groundwater would significantly alter the region's natural hydrology by lowering the water table, impacting wetlands, and reducing flows in streams and rivers. Although inter-basin transfer of water is not currently being done in the Sandhills, it looms as a future threat.

Oil pipelines: There are concerns that efforts to construct a pipeline for crude oil across the Sandhills could pollute the Ogallala aquifer if leakage occurs. Construction of this type that bypasses the Sandhills, rather than goes through the ecoregion, reduces the threat to the water and wildlife resources there.

Lack of knowledge about the region's biological diversity: The Sandhills are unique biologically and ecologically. However, many of the ecoregion's residents have limited opportunities to learn about the plant and animal species that are found there. Ranchers of the region have much knowledge about the Sandhills but often do not have a chance to share this information with others. Lack of understanding and appreciation of the Sandhills could negatively impact future conservation in the ecoregion.

Ranching economics: Increases in property taxes, economic hardships, and other factors are changing ownership patterns (e.g., more nonresident owners), which could affect management decisions and ultimate stewardship of the land.

Conversion and fragmentation of natural habitats: Although most of ecoregion's natural communities are intact, center pivot agricultural development on the eastern and southern border of the Sandhills is accelerating, resulting in a loss of native communities and a decline in biological diversity. Fragmentation of large unbroken tracts of Sandhills prairie by tree plantings, home development, utility-scale wind turbines, roads etc. represent both current and future stresses on the region's biological diversity.

Poorly-sited utility-scale wind turbines: Wind energy development is a growing industry in the Great Plains. There are many benefits to cleaner and renewable energy sources; nevertheless, in order to conserve the biodiversity of the Sandhills, it is important to carefully consider the placement of wind turbines and transmission lines in order to minimize wildlife habitat fragmentation. Areas to avoid include intact grassland and other native habitats. Focus on siting turbines in already disturbed areas (e.g., cultivated lands, old railway/road corridors). Turbines can be halted temporarily during peak migration periods for bats and birds. Pre- and post-construction monitoring should be implemented. See Nebraska Game and Parks Commission guidelines for wind energy development.

Biologically Unique Landscapes of the Sandhills Ecoregion

A goal of the Nebraska Natural Legacy Project is to identify priority landscapes that, if properly managed, will conserve the majority of the state's biological diversity. These landscapes, referred to as Biologically Unique Landscapes (BULs), were selected based on the occurrences of at-risk species and natural communities. See Chapter 3 for a description of the methods used to select the landscapes.

The map on following page shows the BULs for the Sandhills Ecoregion. Following the map are brief descriptions of each BUL, including stresses affecting species and habitats, proposed conservation actions, and lists of the Tier I at-risk species and natural communities found in the landscape. In order to help prioritize conservation in each BUL, we denoted species that occur in only one or a few BULs with superscripts.

Sandhills Biologically Unique Landscapes

Cherry County Wetlands
Dismal River Headwaters
Elkhorn River Headwaters

Middle Niobrara
Platte Confluence (see Mixedgrass Ecoregion for description)
Sandhills Alkaline Lakes
Snake River
Upper Loup Rivers and Tributaries (includes Calamus, Middle Loup and North Loup landscapes)

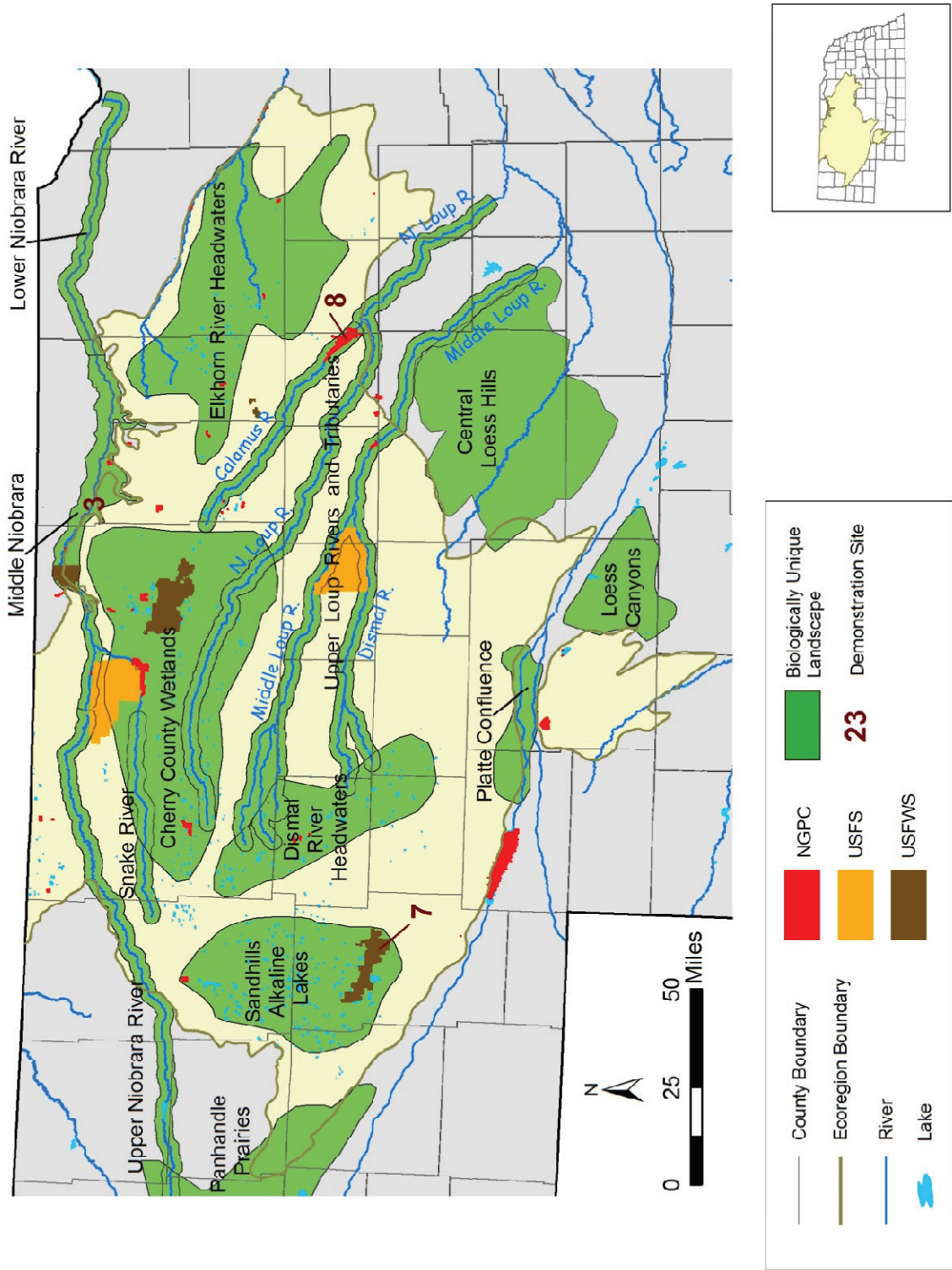
Demonstration Sites of the Sandhills Ecoregion

Demonstration sites are locations across the state with potential for showcasing conservation projects and the results of sustainable management to the public. They provide opportunities for learning about the site’s unique qualities and importance to at-risk species. See Chapter 4 for information on selecting demonstration sites. The Sandhills Ecoregion map shows the location of demonstration sites in the area.

<u>Site name</u>	<u># on map</u>	<u>BUL</u>
Calamus WMA and SRA Tributaries	8	Upper Loup Rivers and
Crescent Lake NWR	7	Sandhills Alkaline Lakes
Niobrara Valley Preserve	3	Middle Niobbrara

Descriptions of each site are found in the write-up for the BUL in which the site is found.

Nebraska Natural Legacy Project: Sandhills Ecoregion



Cherry County Wetlands

Biologically Unique Landscape Description

This landscape occurs in Cherry County in the northern Sandhills. The area consists of high, mostly long linear dunes, with interdunal valleys. Many valleys contain numerous lakes, marshes, wet meadows, and fens that form one of the Sandhills largest wetland complexes. The upland dune grasslands are intact with only limited cropland, primarily center pivot irrigated, in drier valleys.

The North Loup River and its tributaries headwater in this region. The Snake River flows through the northern portion of the landscape. This BUL is important for nesting and migratory water birds, and the wetlands support large populations of reptiles and amphibians. Wet meadows support a large population of the federally and state threatened western prairie fringed orchid. The area is also habitat for several other federal and state listed species including the American burying beetle and whooping crane. The area's numerous high-quality smaller streams support assemblages of rare fish including the pearl dace, the state and federally listed Topeka shiner, the state listed northern redbelly dace, blacknose shiner, and finescale dace. The Valentine National Wildlife Refuge is one of the largest protected areas.

Stresses Affecting Species and Habitats

- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure (e.g., season-long grazing, annual mid-summer haying)
- ❖ Invasive species, primarily reed canary grass, smooth brome, Eurasian phragmites, Garrison creeping-foxtail, narrow-leaf cattail, purple loosestrife, and carp
- ❖ Loss of active blowouts on dunes as habitat for the blowout Penstemon. Lack of fire and some present-day range management practices have greatly reduced blowouts.
- ❖ Wetland drainage, which can also lead to lowered groundwater levels and stream channel down-cutting
- ❖ Stream channelization and in-stream structures barring fish movement
- ❖ Stocking of exotic and game fish in streams with rare fish species
- ❖ Loss of native riparian vegetation from excessive grazing leads to increased run-off, sedimentation, and a lack of stream shading that results in altered water temperatures harmful to fish
- ❖ Poorly-sited utility-scale wind turbines and cellular/television towers

Conservation Strategies

- ❖ Improve implementation of biodiversity management, including increased use of prescribed fire and planned livestock grazing, on wildlife management areas and federal lands. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity.
- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.

- ❖ Restore the natural hydrology of wet meadows and other wetlands through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage)
- ❖ Maintain the natural hydrology of Sandhills streams
- ❖ Reduce the number of culverts on small streams containing rare fish populations by installing bridges
- ❖ Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations nor wetland plant diversity
- ❖ Work with extension and agronomy groups to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows
- ❖ Where feasible, create and maintain blowout complexes on public lands as habitat for the blowout Penstemon through use of prescribed fire and intense livestock grazing
- ❖ Work with the USDA to ensure that wetlands enrolled in their programs allow occasional moderate grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity. Presently, some program wetlands are fenced and not actively managed.
- ❖ Discontinue game fish stocking in streams with rare fish species
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. Avoid placing wind turbines in native prairies or sites used or inhabited recently by threatened and endangered species (e.g., American burying beetle, whooping crane). Wind farms should not be located within the recommended radius of prairie grouse leks and nesting grounds. Turbines can be halted temporarily during peak migration periods for bats and birds. Pre- and post-construction monitoring should be implemented. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

Blowout Penstemon
 Western Prairie Fringed Orchid
 Wolf Spikerush⁴

Animals:

Bell's Vireo
 Burrowing Owl
 Greater Prairie-Chicken
 Loggerhead Shrike
 Long-billed Curlew
 Short-eared Owl
 Trumpeter Swan
 Whooping Crane
 Blanding's Turtle
 American Burying Beetle
 Finescale Dace
 Regal Fritillary

Married Underwing
Whitney Underwing
Mottled Duskywing⁴
Blacknose Shiner⁴
Northern Redbelly Dace
Plains Topminnow
Topeka Shiner²
Ghost Tiger Beetle

Aquatic Communities:

Alkaline Lake*
Freshwater Lake*
Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order, Warm Water Stream
Mid-order, Cold Water Stream

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
Freshwater Seep
Sandhills Fen*
Sandhills Wet Meadow*
Spikerush Vernal Pool*
Cattail Shallow Marsh*
Sandhills Hardstem Bulrush Marsh*
Reed Marsh*
Western Alkaline Marsh
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*
Saline/Alkaline Aquatic Wetland
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

¹ This is the only BUL where the species is known to occur

² Known to occur in only one other BUL

³ Known to occur in only two other BULs

⁴ Known to occur in only three other BULs

Dismal River Headwaters

Biologically Unique Landscape Description

This landscape includes the Dismal River and the area near its headwaters that occur in Cherry, Grant, Arthur, McPherson, and Hooker counties in the west-central Sandhills. The area consists of high, prairie-covered dunes with interdunal valleys. The high water table in the BUL supports numerous lakes, marshes, wet meadows, and fens. Cropland, primarily center pivot irrigated, occurs only occasionally in the valleys.

The Middle Loup River and the North and South Forks of the Dismal Rivers headwater in this region. Birds use the rivers, surrounding floodplain, and marshes of this landscape for nesting and migration habitat. The landscape also supports large populations of reptiles and amphibians and includes populations of the federally and state endangered blowout Penstemon. The only protected areas within the landscape are the Frye Lake and De Fair Lake Wildlife Management Areas.

Stresses Affecting Species and Habitats

- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure
- ❖ Invasive plants, primarily reed canary grass, smooth brome, narrow-leaf cattail, Eurasian phragmites, Garrison creeping-foxtail, eastern red-cedar, and purple loosestrife
- ❖ Loss of active blowouts on dunes as habitat for the blowout Penstemon. Lack of fire and some present-day range management practices have greatly reduced blowouts.
- ❖ Wetland ditching, which can also lead to lowered groundwater levels and stream channel down-cutting
- ❖ Stream channelization and in-stream structures barring fish movement
- ❖ Stocking of exotic and game fish in streams with rare fish
- ❖ Conversion of prairie and groundwater depletions resulting from center pivot irrigation development
- ❖ Loss of native riparian vegetation from excessive grazing leads to increased run-off, sedimentation, and a lack of stream shading that results in altered water temperatures harmful to fish
- ❖ Poorly sited utility-scale wind turbines

Conservation Strategies

- ❖ Improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing, on wildlife management areas in the landscape. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity.
- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.
- ❖ Restore the natural hydrology of wet meadows and other wetlands through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage).
- ❖ Maintain the natural hydrology of Sandhills streams

- ❖ Reduce the number of culverts on small streams containing rare fish populations by installing bridges
- ❖ Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations nor wetland plant diversity
- ❖ Work with extension and agronomy groups to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows
- ❖ Where feasible, create and maintain blowout complexes on public lands as habitat for the blowout Penstemon through use of prescribed fire and intense livestock grazing
- ❖ Offer environmental education programs about prescribed fire to increase public support
- ❖ Work with the USDA to ensure that wetlands enrolled in their programs allow occasional moderate grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity. Presently, some program wetlands are fenced and not actively managed.
- ❖ Discontinue game fish stocking in streams with rare fish species
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. Avoid placing wind turbines in native prairies or sites used or inhabited recently by threatened and endangered species. Wind farms should not be located within the recommended radius of prairie grouse leks and nesting grounds. Turbines can be halted temporarily during peak migration periods for bats and birds. Pre- and post-construction monitoring should be implemented. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

Blowout Penstemon

Animals:

Burrowing Owl

Greater Prairie-Chicken

Loggerhead Shrike

Long-billed Curlew

Short-eared Owl

Trumpeter Swan

Blanding's Turtle

Finescale Dace

Plains Topminnow

Regal Fritillary

Ghost Tiger Beetle

Aquatic Communities:

Freshwater Lake*

Alkaline Lake*

Headwater, Cold Water Stream*

Headwater, Warm Water Stream

Mid-order, Warm Water River
Mid-order, Cold Water River

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
Freshwater Seep
Sandhills Fen*
Sandhills Wet Meadow*
Spikerush Vernal Pool*
Cattail Shallow Marsh*
Reed Marsh*
Western Alkaline Marsh
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*
Saline/Alkaline Aquatic Wetland
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

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Elkhorn River Headwaters

Biologically Unique Landscape Description

This landscape occurs in the northeastern Sandhills and includes large areas of Brown, Rock, Holt, Garfield, and Wheeler counties. The area consists mainly of level sand plain with a regionally high water table and extensive wet meadows and shallow marshes. Rolling sand dunes and Sandhill marshes and lakes are scattered through the region. Center pivot crop fields are common in areas.

The South Fork and North Fork of the Elkhorn River headwater in the region. The BUL's meadows support the state's largest populations of the federally and state threatened western prairie fringed orchid. The area is also habitat for several other federal and state listed species including the small white lady's-slipper orchid, American burying beetle, and whooping crane. Waterfowl and other waterbirds make extensive use of the region's wetlands. Protected areas in the BUL include several Wildlife Management Areas, among them Goose Lake, South Pine, Swan Lake, and Dry Creek.

Stresses Affecting Species and Habitats

- ❖ Livestock (and horses) grazing heavily in riparian zones may lead to soil compaction, erosion, and increased sediment and nutrient loads in the stream
- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure
- ❖ Invasive species, primarily reed canary grass, smooth brome, Kentucky bluegrass, leafy spurge, narrow-leaf cattail, Eurasian phragmites, Garrison creeping-foxtail, eastern red-cedar, purple loosestrife, and carp
- ❖ Die-off of mature cottonwoods
- ❖ Herbicide application in meadows to control leafy spurge is a threat to western prairie fringed orchid populations and plant diversity
- ❖ Wetland drainage, which can also lead to lowered groundwater levels and stream channel down-cutting
- ❖ Stream channelization and in-stream structures, including culverts, that bar fish movement
- ❖ Conversion of prairie and groundwater depletions resulting from center pivot irrigation development
- ❖ Loss of native riparian vegetation from excessive grazing leads to increased run-off, sedimentation, and a lack of stream shading that results in altered water temperatures harmful to fish
- ❖ ATV use in waterway
- ❖ Poorly-sited utility-scale wind turbines

Conservation Strategies

- ❖ Improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing, on wildlife management areas in the landscape. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity.
- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.
- ❖ Restore the natural hydrology of wet meadows through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage)
- ❖ Maintain the natural hydrology of Sandhills streams
- ❖ Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations nor plant diversity
- ❖ Work with the USDA to ensure that wetlands enrolled in their programs allow occasional moderate grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity. Presently, some program wetlands are fenced and not actively managed.
- ❖ Work with extension and agronomy groups to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows
- ❖ Restore native riparian flora
- ❖ Place stock tanks for livestock away from stream channel and promote programs that fund riparian buffer strips
- ❖ Promote citizen-science stream-quality monitoring

- ❖ Discontinue game fish stocking in streams with rare fish
- ❖ Install fences to discourage ATV access to stream beds. Also, install signage detailing the impacts ATV use has on biodiversity, and inform law enforcement of problematic areas
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. Avoid placing wind turbines in areas used or inhabited recently by threatened and endangered species. Wind farms should not be located within the recommended radius of prairie grouse leks and nesting grounds. Turbines can be halted temporarily during peak migration periods for bats and birds. Pre- and post-construction monitoring should be implemented. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

Blowout Penstemon
 Hall's Bulrush²
 Small White Lady's-slipper³
 Western Prairie Fringed Orchid
 Wolf Spikerush⁴

Animals:

Northern River Otter
 Bell's Vireo
 Burrowing Owl
 Greater Prairie-Chicken
 Loggerhead Shrike
 Trumpeter Swan
 Whooping Crane
 Blanding's Turtle
 American Burying Beetle
 Ghost Tiger Beetle
 Regal Fritillary
 Bucholz Black Dash
 Plains Topminnow
 Pimpleback
 Plain Pocketbook

Aquatic Communities:

Freshwater Lake*
 Headwater, Warm Water Stream
 Mid-order, Warm Water Stream

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
 Cottonwood-Diamond Willow Woodland*
 Sandbar Willow Shrubland*

Chokecherry-Plum Shrub Thicket
 Freshwater Seep
 Sandhills Fen*
 Sandhills Wet Meadow*
 Spikerush Vernal Pool
 Cattail Shallow Marsh*
 Sandhills Hardstem Bulrush Marsh*
 Reed Marsh*
 Northern Pondweed Aquatic Wetland*
 Water-lily Aquatic Wetland
 Eastern Sand Prairie*
 Sandhills Mesic Tall-grass Prairie*
 Sandhills Dune Prairie
 Perennial Sandbar
 Sandbar/Mudflat

* Priority for conservation in this BUL

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Middle Niobrara

Biologically Unique Landscape Description

The Middle Niobrara BUL includes a 76-mile reach of the river in Cherry, Keya Paha, Rock, and Brown counties. This stretch of river has been designated as a National Wild and Scenic River. The Middle Niobrara River valley is deeply incised, and is the intersection of five diverse plant communities: northern mixed-grass prairie, Sandhills prairie, Rocky Mountain pine woodland, northern boreal woodland, and eastern deciduous woodland. The valley, with its diverse mix of plant communities, is home to an incredible diversity of native animal and plant species, including many glacial relict species. The landscape is often referred to as the biological crossroads of the Midwest. The Nature Conservancy's 56,000 acre Niobrara Valley Preserve alone contains 581 species of plants, 213 birds, 86 lichens, 44 mammals, 25 fish, 17 reptiles, and 8 amphibians. The Middle Niobrara River valley also provides habitat for many at-risk species including whooping crane, bald eagle, piping plover, interior least tern, and Bailey's eastern woodrat, a subspecies endemic to the area. The primary protected areas within the landscape include The Nature Conservancy's Niobrara Valley Preserve, Fort Niobrara National Wildlife Refuge, Smith Falls State Park, and several state wildlife management areas and state recreation areas.

Natural Legacy Project Demonstration Site

3. Niobrara Valley Preserve - The Nature Conservancy

The valley is a mosaic of mixed-grass, tall-grass and sandhills prairie. The steep canyons and slopes lining the river contain a mix of three woodland types: northern boreal, western coniferous and eastern deciduous. The Niobrara Valley Preserve is one of the few locations where bison are used to manage the prairies, in addition to cattle. The Nature Conservancy also uses prescribed fire as a management tool. This site has most of the natural communities of the BUL.

Stresses Affecting Species and Habitats

- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure
- ❖ Interruption of natural fire frequency leading to increased tree densities, primarily eastern red-cedar and Ponderosa pine, excess litter accumulation and exotic plant invasion in the valley
- ❖ Invasive plants in stream channel, wetlands, woodlands, and grasslands; the primary species of concern include reed canary grass, narrow-leaf cattail, Eurasian phragmites, purple loosestrife, leafy spurge, Kentucky bluegrass, and smooth brome.
- ❖ Upstream dams and water diversion
- ❖ Development of homes, cabins, ranchettes, roads, and recreational facilities

Conservation Strategies

- ❖ Implement planned grazing strategies on private lands
- ❖ Conduct integrated weed control efforts to control invasive species
- ❖ Increase tree thinning and use of prescribed fire in the valley on private and public lands
- ❖ Work with interested landowners to use conservation easements or voluntary fee title acquisition to protect important habitats within the valley from development
- ❖ Work with local government agencies to implement zoning in the valley to limit development
- ❖ Promote the use of conservation buyers in the valley

Tier I At-risk Species

Plants:

Prairie Moonwort⁴

Large-spike Prairie-clover

Small White Lady's-slipper Orchid³

Animals:

Northern River Otter

Bailey's Eastern Woodrat³

Bell's Vireo

Burrowing Owl

Interior Least Tern

Long-billed Curlew
Piping Plover
Whooping Crane
Wood Thrush
Blanding's Turtle
American Burying Beetle
Iowa Skipper
Ottoe Skipper
Regal Fritillary
Mottled Duskywing⁴
Northern Redbelly Dace
Plains Topminnow

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order, Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Dry Upland Bur Oak Woodland*
Paper Birch Springbranch Canyon Forest*
Basswood-Ironwood Springbranch Canyon Forest*
Green Ash-Elm-Hackberry Canyon Bottom Woodland
Green Ash-Eastern Red-cedar Scarp Woodland
Dry Ponderosa Pine Open Woodland and Savanna*
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep*
Northern Cordgrass Wet Prairie
Sandhills Wet Meadow
Cattail Shallow Marsh*
Reed Marsh
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie
Sandhills Dune Prairie*
Sandhills Dry Valley Prairie
Threadleaf Sedge Western Mixed-grass Prairie
Great Plains Gravel-Cobble Prairie*
Perennial Sandbar*
Sandbar/Mudflat*

* Priority for conservation in this BUL

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Sandhills Alkaline Lakes

Biologically Unique Landscape Description

This landscape occurs in Sheridan, Morrill, and Garden counties in the western Sandhills. The area consists of prairie-covered high dunes and interdunal valleys. The area has a poorly-developed drainage system, and many of the region's wetlands and lakes are alkaline.

This is the largest alkaline wetland complex in the state and a vital nesting and migratory habitat for shorebirds and other waterbirds, including American avocets and black-necked stilts. This landscape includes the largest populations of the federally and state endangered blowout Penstemon in the state. Conservation lands in the BUL include the Crescent Lake National Wildlife Refuge, the Nature Conservancy's Graves Ranch Preserve, and Smith Lake Wildlife Management Area.

Natural Legacy Demonstration Site

7. Crescent Lake National Wildlife Refuge - U.S. Fish and Wildlife Service

This Refuge, located in the Nebraska Panhandle, has over 45,000 acres of rolling sandhills and numerous wetlands. The refuge grasslands range from the densely-vegetated meadows to the sparsely-covered "choppies" dune tops. Managers are challenged with management of several at-risk species, including those that need open sand blowouts. Natural communities at this Refuge include sandhills wet meadow, sandhills hardstem bulrush marsh, reed marsh, western alkaline meadow, western alkaline marsh, and sandhill dune prairie.

Stresses Affecting Species and Habitats

- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure (e.g., season-long grazing, annual mid-summer haying)
- ❖ Invasive species, primarily reed canary grass, smooth brome, Eurasian phragmites, Garrison creeping-foxtail, narrow-leaf cattail, purple loosestrife, and carp
- ❖ Loss of active blowouts on dunes as habitat for the blowout Penstemon. Lack of fire and some present-day range management practices have greatly reduced blowouts.
- ❖ Wetland drainage, which can also lead to lowered groundwater levels and stream channel down-cutting
- ❖ Stream channelization and in-stream structures barring fish movement
- ❖ Stocking of exotic and game fish in streams with rare fish species
- ❖ Conversion of prairie and groundwater depletions resulting from center pivot irrigation development

- ❖ Increased water alkalinity
- ❖ Poorly-sited utility-scale wind turbines

Conservation Strategies

- ❖ Improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing, on wildlife management areas and federal lands. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity.
- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.
- ❖ Restore the natural hydrology of wet meadows through ditch plugging and water control structures
- ❖ Maintain the natural hydrology of Sandhills streams
- ❖ Reduce the number of culverts on small streams containing rare fish populations by installing bridges
- ❖ Implement integrated noxious weed control strategies that have minimum impacts to meadow and wetland plant diversity. Work with extension and agronomy groups to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows.
- ❖ Where feasible, create and maintain blowout complexes on public lands as habitat for the blowout Penstemon through use of prescribed fire and intense livestock grazing
- ❖ Promote and implement increased shorebird research and increase management of wetlands as shorebird habitat
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

Blowout Penstemon

Animals:

Bell's Vireo

Burrowing Owl

Loggerhead Shrike

Long-billed Curlew

Piping Plover

Short-eared Owl

Trumpeter Swan

Regal Fritillary

Aquatic Communities:

Alkaline Lake*
 Freshwater Lake*
 Headwater, warm water stream
 Mid-order, warm water river

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
 Freshwater Seep
 Western Alkaline Meadow*
 Cattail Shallow Marsh
 Reed Marsh
 Western Alkaline Marsh*
 Northern Pondweed Aquatic Wetland
 Water-lily Aquatic Wetland
 Saline/Alkaline Aquatic Wetland*
 Sandhills Dune Prairie*
 Sandhills Dry Valley Prairie

* Priority for conservation in this BUL

Snake River

Biologically Unique Landscape Description

This landscape includes the upper reaches of the Snake River from the western end of Merritt Reservoir westward to the stream's headwaters. The landscape includes the river channel and a two-mile buffer on each side of the river. The Snake River begins as a small spring-fed stream flowing through Sandhills meadows. As the stream gains flow, its valley becomes deeply incised. Here, the stream bluffs support pine woodlands and Sandhills prairies. The Snake River is a pristine coldwater stream with a narrow channel that maintains a near constant flow rate throughout the year because of its spring-fed nature. It supports an assemblage of rare fish including the plains topminnow, pearl dace, northern redbelly dace, and finescale dace. Merritt dam on the lower Snake River blocks fish movement into the upper reaches. There are no permanently protected areas in this landscape.

Stresses Affecting Species and Habitats

- ❖ Specific grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure
- ❖ Ditching and channel straightening in the upper reaches of the Snake River that lead to stream down-cutting and lowered groundwater levels
- ❖ Stocking exotic game fish into the river and tributary streams with rare fish species
- ❖ Golf course and housing development
- ❖ Invasive species, including, reed canary grass, purple loosestrife, Eurasian phragmites, smooth brome, eastern red-cedar, Garrison creeping-foxtail, and carp

- ❖ Conversion of prairie and water depletions from center pivot irrigation development
- ❖ Poorly-sited utility-scale wind turbines

Conservation Strategies

- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid repeated annual mid-summer haying and do not require ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.
- ❖ Implement integrated invasive weed control strategies that have minimum impacts to meadow and wetland plant diversity
- ❖ Restore hydrology of wet meadows through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage)
- ❖ Reduce the number of culverts on small streams containing rare fish by installing bridges
- ❖ Maintain the natural hydrology of the river and tributary streams
- ❖ Protect important stretches of the Snake River valley through zoning and conservation easements
- ❖ Discontinue exotic and game fish stocking in the river and tributary streams
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

None

Animals:

Finescale Dace

Northern Redbelly Dace

Plains Topminnow

Regal Fritillary

Bailey's Eastern Woodrat³

Aquatic Communities:

Headwater, Cold Water Stream*

Terrestrial Communities:

Green Ash-Elm-Hackberry Canyon Bottom Woodland

Sandbar Willow Shrubland

Chokecherry-Plum Shrub Thicket

Freshwater Seep

Northern Cordgrass Wet Prairie*

Sandhills Wet Meadow*

Cattail Shallow Marsh

Reed Marsh

Eastern Sand Prairie

Sandhills Dune Prairie
 Sandhills Dry Valley Prairie
 Perennial Sandbar
 Sandbar/Mudflat

* Priority for conservation in this BUL

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³ Known to occur in only two other BULs

⁴ Known to occur in only three other BULs

Upper Loup Rivers and Tributaries

Biologically Unique Landscape Description

This landscape includes the upper reaches of the Middle Loup, Dismal, North Loup and Calamus rivers from their headwaters in the central Sandhills southeastward to where the rivers enter the loess hills. The landscape includes the river channels and a two-mile buffer on each side of the channels. These rivers start as spring-fed, narrow streams in Sandhills meadows. Here, many of the meadows have been ditched and the streams channelized. The streams gain flow throughout their journey, taking on a meandering and braided characteristic. The valley bottoms are occupied by wet meadows with some cottonwood woodlands, marshes, and isolated cropland. The bluffs are mainly Sandhills dune prairie. The steep bluffs of the North Fork and the South Fork of the Dismal's rivers support groves of eastern red-cedar woodland.

The river flows are nearly constant throughout the year because their primary source comes from consistent groundwater seepage. The only mainstem impoundment in the region is on the Calamus River, forming Calamus Reservoir. Downstream diversions on the Loup rivers, within the loess hills, block fish movement into the upper reaches of these streams. Many small, colder-water tributary streams flow into these rivers.

The upper reaches of the rivers and some tributaries support assemblages of rare fish, including the Topeka shiner, blacknose shiner, and finescale dace. The federally and state endangered whooping cranes use braided channels and adjacent meadows as migratory stopover roosts. The federally and state threatened western prairie fringed orchid occurs in wet meadows within the valleys. The American burying beetle is found within this landscape. Protected areas within the landscape include portions of the Nebraska National Forest and a few smaller wildlife management areas.

Natural Legacy Demonstration Site

8. Calamus Wildlife Management Area and State Recreation Area – Nebraska Game and Parks Commission

Calamus Reservoir and the adjacent Calamus Wildlife Management Area exhibit a variety of habitats including Sandhills dune prairie, Sandhills freshwater marsh, and wet meadows. Visitation rates are high in this relative central location in the state, making it beneficial for demonstrating habitat projects.

Stresses Affecting Species and Habitats

- ❖ Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure
- ❖ Ditching and channel straightening in the upper stream reaches that often lead to channel degradation and reduced groundwater levels
- ❖ Stocking exotic and game fish into tributary streams with rare fish
- ❖ Golf course and housing development, particularly along the Calamus River
- ❖ Invasive species, including reed canary grass, purple loosestrife, narrow-leaf cattail, Eurasian phragmites, smooth brome, eastern red-cedar, Garrison creeping-foxtail, Russian-olive, and carp
- ❖ Dam building and water diversion on the rivers
- ❖ Conversion of grasslands and groundwater depletion from center pivot irrigation
- ❖ Poorly-sited utility-scale wind turbines

Conservation Strategies

- ❖ Work with private landowners to develop and implement creative methods of forage utilization on wet meadows that avoid repeated annual mid-summer haying and do not require ditching to facilitate haying. Also, work with private landowners to implement strategic grazing on uplands.
- ❖ Implement integrated invasive weed control strategies that have minimum impacts to meadow and wetland plant diversity, including programs to reduce eastern red-cedar encroachment into grasslands
- ❖ Restore the hydrology of wet meadows and fens through ditch-plugging and water control structures (ensure that in-stream structures allow for fish passage)
- ❖ Reduce the number of culverts on small streams containing rare fish by installing bridges
- ❖ Remove non-functional in-stream structures that form barriers to aquatic species movement (e.g., water diversion structures)
- ❖ Protect important stretches of the river valley through zoning and conservation easements
- ❖ Discontinue exotic and game fish stocking in the river and tributary streams
- ❖ Work with wind energy companies to select turbine sites that minimize fragmentation and impacts to native species. See Nebraska Game and Parks Commission guidelines for wind energy development.

Tier I At-risk Species

Plants:

Blowout Penstemon

Hall's Bulrush²

Western Prairie Fringed Orchid

Wolf Spikerush⁴

Animals:

Northern River Otter
Bell's Vireo
Burrowing Owl
Interior Least Tern
Long-billed Curlew
Piping Plover
Trumpeter Swan
Whooping Crane
Blanding's Turtle
American Burying Beetle
Iowa Skipper
Regal Fritillary
Married Underwing
Ghost Tiger Beetle
Blacknose Shiner⁴
Finescale Dace
Northern Redbelly Dace
Plains Topminnow
Topeka Shiner²

Aquatic Communities:

Headwater, cold water stream
Headwater, warm water stream*
Mid-order, warm water river*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood-Diamond Willow Woodland*
Cottonwood Riparian Woodland
Dry Upland Bur Oak Woodland*
Green Ash-Elm-Hackberry Canyon Bottom Woodland
Green Ash-Eastern Red-cedar Scarp Woodland*
Sandbar Willow Shrubland*
Riparian Dogwood-False Indigobush Shrubland*
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep*
Northern Cordgrass Wet Prairie*
Sandhills Wet Meadow
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Sandhills Hardstem Bulrush Marsh*
Reed Marsh*
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*

Loess Mixed-grass Prairie
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar*
Sandbar/Mudflat*

* Priority for conservation in this BUL

¹ This is the only BUL where the species is known to occur

² Known to occur in only one other BUL

³ Known to occur in only two other BULs

⁴ Known to occur in only three other BULs
